Pure Data for Analytics System Administration

Technical Account Management Team
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V 1.1

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PureData System for Analytics

System administration Agenda

- **Managing your operating system**
  - –A word on upgrades
  - –Users
  - –Variables
  - –Securely managing passwords
- **Managing the database service**
  - –Starting and stopping the system
  - –Reviewing system health
  - –Interacting with user sessions and queries
- **Interacting with system objects**
  - –Users
  - –Groups – rights and workload groups
  - –Databases
  - –Tables/views/synonyms
  - –Privileges/access rights
- **Utility scripts**
  - –Nz_toolkit scripts
  - –Other support scripts
- **Extending your environment**
  - –Installing SQL Extensions
  - –Installing IBM Netezza Analytics

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Upgrades

- IBM regularly releases software and firmware upgrades and patches. These fall into four main categories:
  - Operating system releases
  - Host management scripts (HPF)
  - System firmware (FDT)
  - Database software (NPS)

- You can subscribe for notification when these become available on the IBM website – your IBM technical team may be able to advise when patches are available as well.

- If you need advice on whether to upgrade or not reach out to your IBM account team.
  - IBM will carry out ALL upgrades – all that is needed is a PMR logged with support
  - IBM can then advise of prerequisites, timescales and effort involved
  - Currently, major upgrade activity (typically firmware) support requirese a week of notice for upgrades done between 9am – 5pm EST Mon – Fri, or two weeks outside that window, such as weekends.

‘Out of the box’ environment

- The PureData for Analytics appliance is a dedicated platform and as such is fairly simple to administer..
- The database runs on an active/passive clustered environment. There are two servers (hosts). One is the **active** host (running the database) the other is the **passive** host (waiting to take over if the active host gets in trouble)
- Each host comes with two defined users
  - root
  - nz (database power user)
- If you need more OS level users this can be done but you will need to actively manage these users yourself and be aware of implications of the active/passive cluster environment
- The filesystems are standard, pre-allocated and cannot be changed. The /nz and /export/home filesystems are part of the cluster and in case of failover from the active to passive host will migrate.
- Therefore if you have processes that rely on scripts or data being available it’s recommended these are placed in /export/home/ (possibly in the nz user homes directory, /export/home/nz)

Environment Variables

Variable	Notes
NZ_HOST	Set to the hostname or IP address of the NPS System
NZ_DATABASE	Set to the specific database to connect to
NZ_USER	The database user you wish to connect as
NZ_PASSWORD	Authentication password for the database user

- There are several environment variables required to support the NPS database administration and system administration tools:
  - NZ_HOST, NZ_DATABASE, NZ_USER are the most commonly used environment variables and by default will be set in the user's .bashrc file
  - If these are not set on the active host you will be prompted for the details every time you call a system command.
- To avoid displaying the password in the environment variable use the nzpassword command to create a locally stored encrypted password.
- These variables apply for any client tools on other boxes (such as ETL platforms).

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Starting and stopping the system

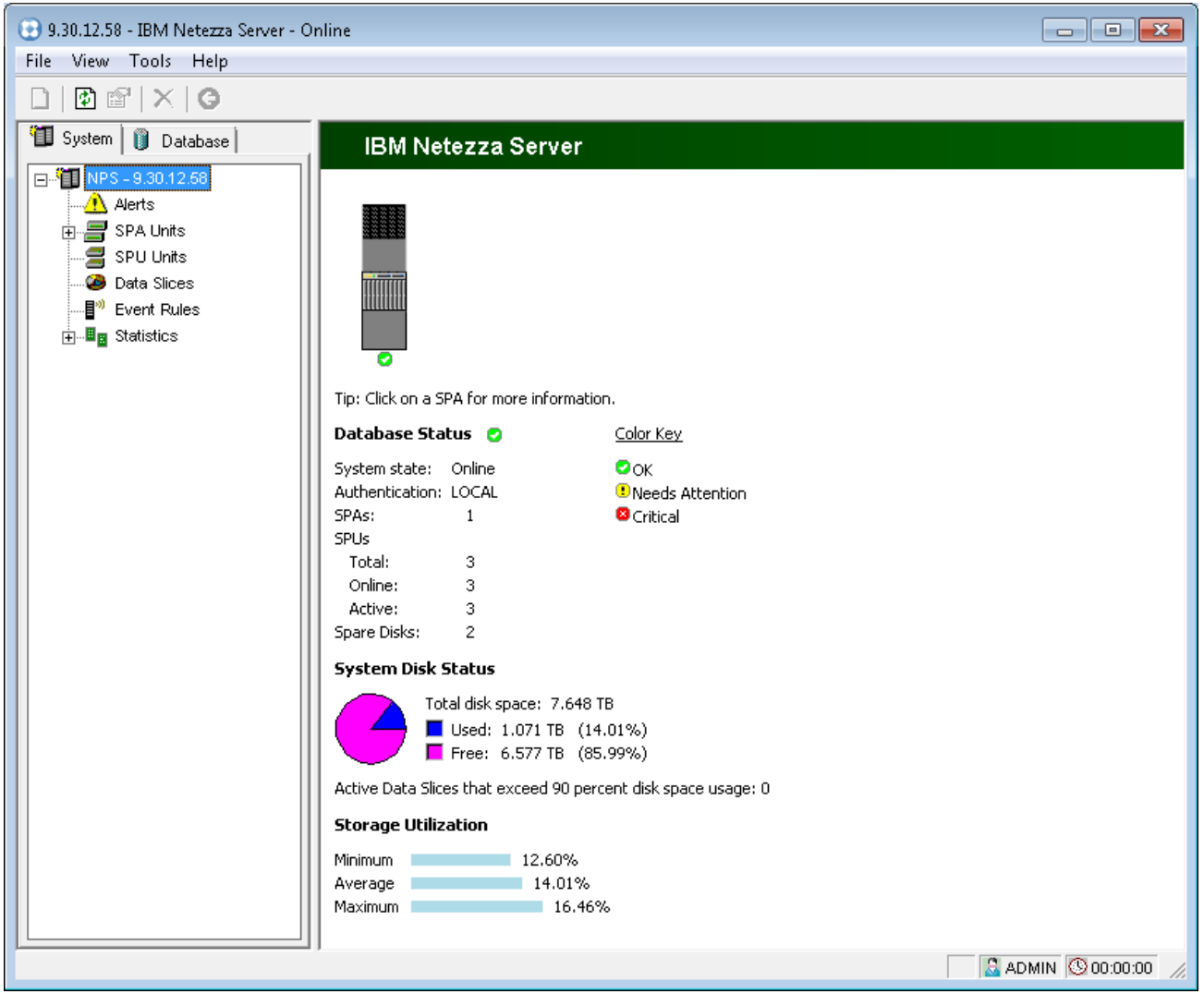
- `nzstart <options>`
  - Command used to start the NPS System.
  - Same as ‘nzsystem start’
- `nzstop <options>`
  - Command used to stop the NPS System.
  - Same as ‘nzsystem stop’

- **The `nzstart` and `nzstop` commands must be run from the NPS host as the user nz.**
- `nzsystem restart`
  - Command used to stop and start the database immediately

System state changes

- When the PureData appliance starts, or when nzstart is run, the system goes through a number of state changes:
  - `Stopped` → `Initializing` → `Pre-Online` → `Resuming` → `Online`
    - `Stopped` — The system is not running
    - `Initializing` — The system is transitioning to initialized
    - `Pre-Online` — The first phase of `Resuming`
    - `Resuming` — The system is transitioning to `Online`
    - `Online` — System is running normally
- `nzstate show`
  - Command to display the current state of the NPS System
- Don't worry about intermediate states. The main thing to focus on is if the system is online or not.

System state changes



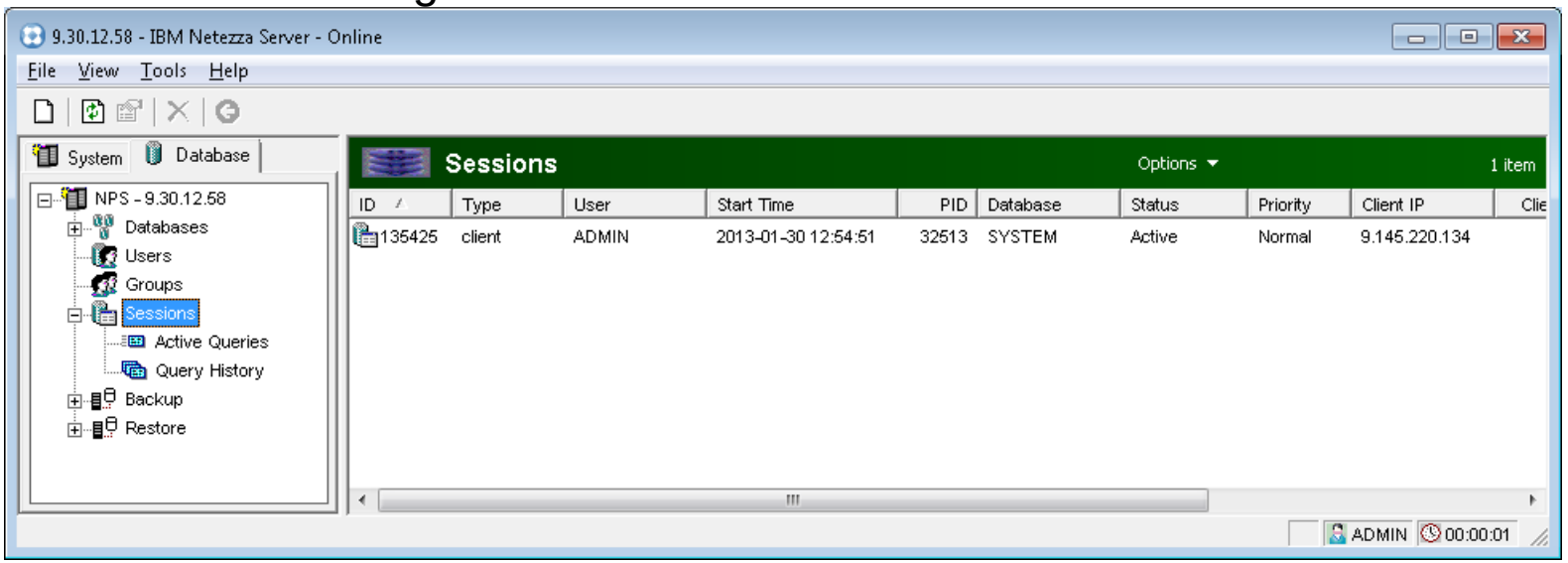
Viewing connected sessions

- Command line – nzsession

```
- [nz@nz80409-h1 ~]$ nzsession

- ID    Type User  Start Time              PID   Database State  Priority Name Client IP      Client PID Command
- ----- ---- ----- ----------------------- ----- -------- ------ ---------- -------------- ---------- ------------------------
- 74911 sql  ADMIN 21-May-12, 11:09:52 EDT 13492 SYSTEM   idle   normal        172.16.251.190       4744 select ds.ds_id, prm.sdm
- 74934 sql  ADMIN 21-May-12, 11:12:17 EDT 14202 SYSTEM   active normal             127.0.0.1      14201 SELECT session_id, clien
```

- GUI
  - Needs refreshing to see the current state



Viewing active queries

- Command line – nzsession -activetxn

```
[nz@nz80409-h1 ~]$ nzsession -activetxn

ID    Type User  Start Time              PID   Database State  Priority Name Client IP      Client PID Command
----- ---- ----- ----------------------- ----- -------- ------ ------------ -------------- ---------- -----------------------
74934 sql  ADMIN 21-May-12, 11:12:17 EDT 14202 SYSTEM   active normal             127.0.0.1      14201 SELECT session_id, clien
```

- GUI
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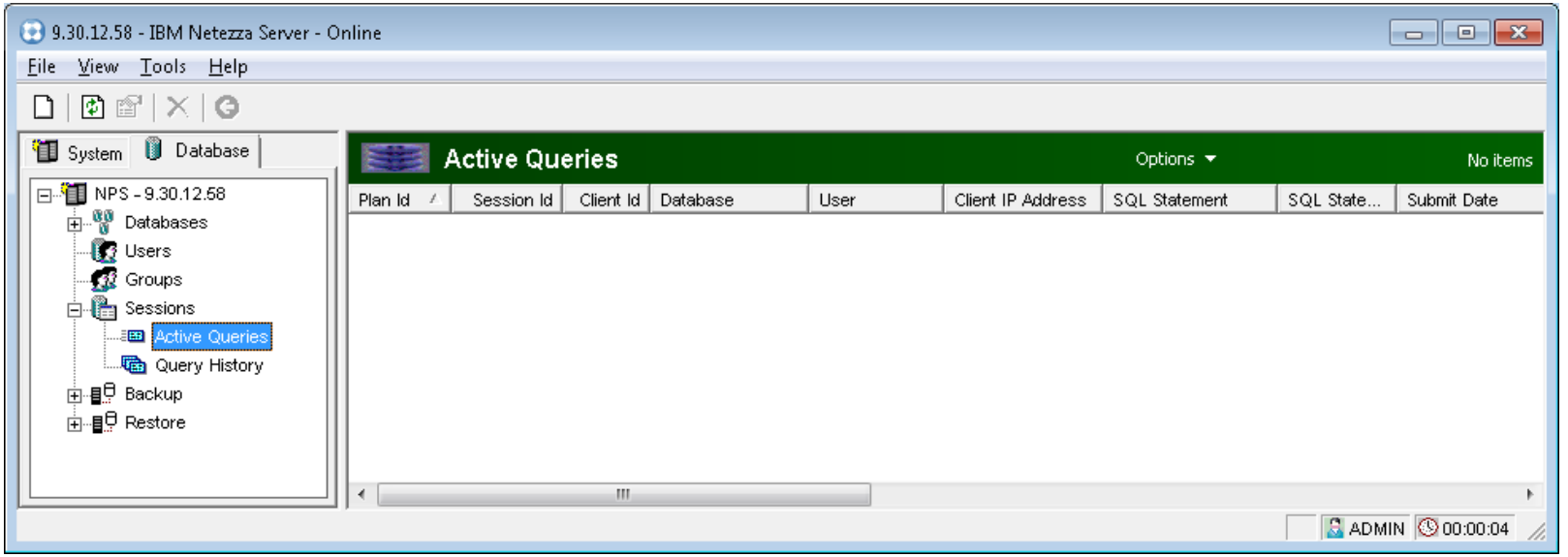


Aborting sessions

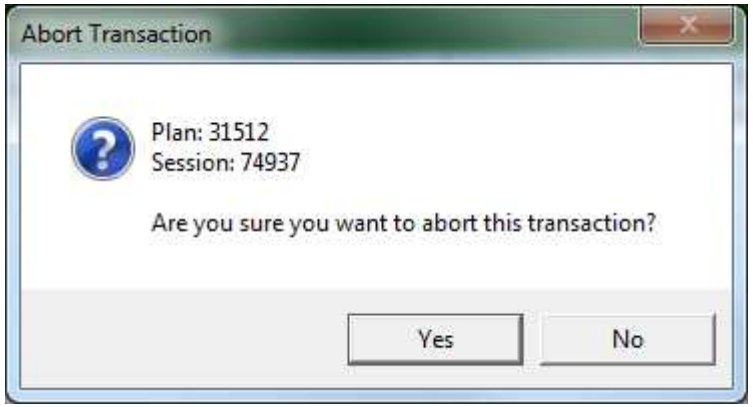
- Command line – nzsession

```
- [nz@nz80409-h1 ~]$ nzsession

- ID    Type User  Start Time              PID   Database State  Priority Name Client IP      Client PID Command
- ----- ---- ----- ----------------------- ----- -------- ------ ------------ -------------- ---------- ------------------------
- 74911 sql  ADMIN 21-May-12, 11:09:52 EDT 13492 SYSTEM   idle   normal        172.16.251.190       4744 select q.qs_planid, q.qs
- 74956 sql  ADMIN 21-May-12, 11:15:05 EDT 15112 SYSTEM   active normal             127.0.0.1      15111 SELECT session_id, clien

- [nz@nz80409-h1 ~]$ nzsession abort -id 74956
- Are you sure you want to abort the session (y|n)? [n] y
```

- GUI
- Right click > Abort



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Users

- Standard SQL commands are all documented in the Database User guide:
- Create User:
  - `CREATE USER test_user W?IH PASSWORD ‘test_user’`
- Change user password:
  - `ALTER USER test_user WITH PASSWORD ‘new password’`
- Change user password and pre-expire:
  - `ALTER USRE test_user WITH PASSWORD ‘new password’ EXPIRE PASSWORD:`
- Add user to a resource group (for workload management):
  - `ALTER USER test_user WITH RESOURCEGROUP resource_group1?`
- Add to a rights group (for privilege management)
  - `ALTER USER test_user WITH IN GROUP rights_group1`
- Drop a user (who must not own any objects – we can’t cascade drop)
  - `DROP USER test_user;`
  - You can do all this via the admin GUI. **However** SQL is easier to record, play back and repeat as needed.

Users - CLI

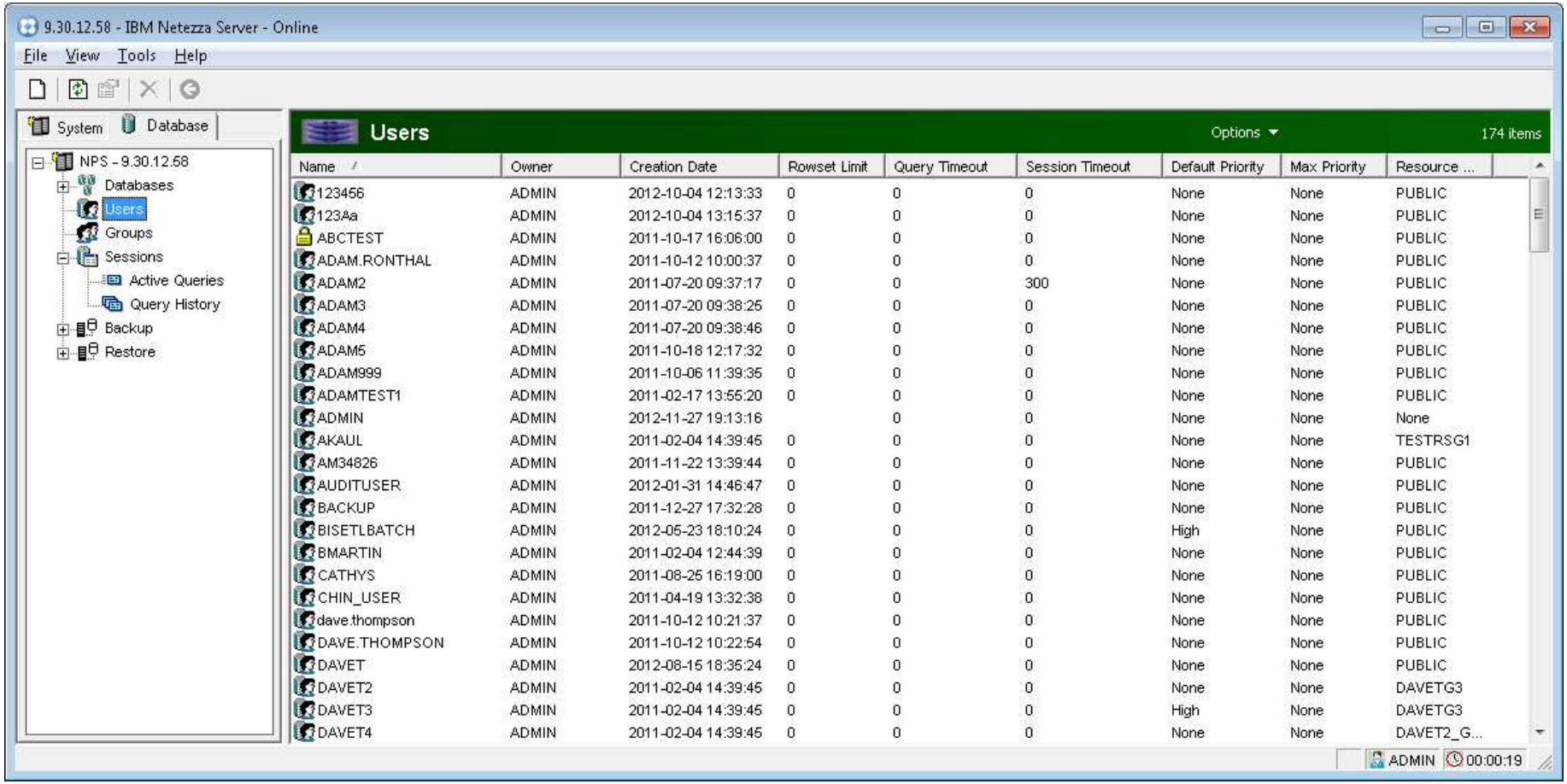
- List users:

```
[nz@nz80409-h1 ~]$ nzsql
Welcome to nzsql, the IBM Netezza SQL interactive terminal.

Type:  \h for help with SQL commands
       \? for help on internal slash commands
       \g or terminate with semicolon to execute query
       \q to quit

SYSTEM(ADMIN)=> \du
                                                                List of Users
     USERNAME      |     VALIDUNTIL      | ROWLIMIT | SESSIONTIMEOUT | QUERYTIMEOUT | DEF_PRIORITY | MAX_PRIORITY | USERESOURCEGRPID | USERESOURCEGRPNAME |
   CROSS_JOINS_ALLOWED
-------------------+---------------------+----------+----------------+--------------+--------------+--------------+------------------+--------------------+------------
   ---------
 ABCTEST           |                     |        0 |              0 |            0 | NONE         | NONE         |                  | PUBLIC             | NULL
 ADAM.RONTHAL      |                     |        0 |              0 |            0 | NONE         | NONE         |                  | PUBLIC             | NULL
 ADAM2             |                     |        0 |            300 |            0 | NONE         | NONE         |                  | PUBLIC             | NULL
 ADAM3             |                     |        0 |              0 |            0 | NONE         | NONE         |                  | PUBLIC             | NULL
 ADAM4             |                     |        0 |              0 |            0 | NONE         | NONE         |                  | PUBLIC             | NULL
 ADAM5             |                     |        0 |              0 |            0 | NONE         | NONE         |                  | PUBLIC             | NULL
 ADAM999           |                     |        0 |              0 |            0 | NONE         | NONE         |                  | PUBLIC             | NULL
 ADAMTEST1         |                     |        0 |              0 |            0 | NONE         | NONE         |                  | PUBLIC             | NULL
```

Users - GUI


9.30.12.58 - IBM Netezza Server - Online
File View Tools Help
System Database
NPS - 9.30.12.58
Databases
Users
Groups
Sessions
Active Queries
Query History
Backup
Restore
Users
Options
174 items
Name | Owner | Creation Date | Rowset Limit | Query Timeout | Session Timeout | Default Priority | Max Priority | Resource ...
123456 | ADMIN | 2012-10-04 12:13:33 | 0 | 0 | 0 | None | None | PUBLIC
123Aa | ADMIN | 2012-10-04 13:15:37 | 0 | 0 | 0 | None | None | PUBLIC
ABCTEST | ADMIN | 2011-10-17 16:06:00 | 0 | 0 | 0 | None | None | PUBLIC
ADAM.RONTHAL | ADMIN | 2011-10-12 10:00:37 | 0 | 0 | 0 | None | None | PUBLIC
ADAM2 | ADMIN | 2011-07-20 09:37:17 | 0 | 0 | 300 | None | None | PUBLIC
ADAM3 | ADMIN | 2011-07-20 09:38:25 | 0 | 0 | 0 | None | None | PUBLIC
ADAM4 | ADMIN | 2011-07-20 09:38:46 | 0 | 0 | 0 | None | None | PUBLIC
ADAM5 | ADMIN | 2011-10-18 12:17:32 | 0 | 0 | 0 | None | None | PUBLIC
ADAM999 | ADMIN | 2011-10-06 11:39:35 | 0 | 0 | 0 | None | None | PUBLIC
ADAMTEST1 | ADMIN | 2011-02-17 13:55:20 | 0 | 0 | 0 | None | None | PUBLIC
ADMIN | ADMIN | 2012-11-27 19:13:16 | | 0 | 0 | None | None | None
AKAUL | ADMIN | 2011-02-04 14:39:45 | 0 | 0 | 0 | None | None | TESTRSG1
AM34826 | ADMIN | 2011-11-22 13:39:44 | 0 | 0 | 0 | None | None | PUBLIC
AUDITUSER | ADMIN | 2012-01-31 14:46:47 | 0 | 0 | 0 | None | None | PUBLIC
BACKUP | ADMIN | 2011-12-27 17:32:28 | 0 | 0 | 0 | None | None | PUBLIC
BISETLBATCH | ADMIN | 2012-05-23 18:10:24 | 0 | 0 | 0 | High | None | PUBLIC
BMARTIN | ADMIN | 2011-02-04 12:44:39 | 0 | 0 | 0 | None | None | PUBLIC
CATHYS | ADMIN | 2011-08-25 16:19:00 | 0 | 0 | 0 | None | None | PUBLIC
CHIN_USER | ADMIN | 2011-04-19 13:32:38 | 0 | 0 | 0 | None | None | PUBLIC
dave.thompson | ADMIN | 2011-10-12 10:21:37 | 0 | 0 | 0 | None | None | PUBLIC
DAVE.THOMPSON | ADMIN | 2011-10-12 10:22:54 | 0 | 0 | 0 | None | None | PUBLIC
DAVET | ADMIN | 2012-08-15 18:35:24 | 0 | 0 | 0 | None | None | PUBLIC
DAVET2 | ADMIN | 2011-02-04 14:39:45 | 0 | 0 | 0 | None | None | DAVETG3
DAVET3 | ADMIN | 2011-02-04 14:39:45 | 0 | 0 | 0 | High | None | DAVETG3
DAVET4 | ADMIN | 2011-02-04 14:39:45 | 0 | 0 | 0 | None | None | DAVET2_G...
ADMIN
00:00:19

Databases

- A PureData for Analytics database is similar to (but not the same as!) a schema in other relational database products – it's a logical construct.
- This means it is quick to create/change and there are few options.
- Create
  - `CREATE DATABASE new_database`
- Rename
  - `ALTER DATABASE new_database RENAME old_database`
- When creating databases consider:
  - Size of the database (backups are at the database level)
  - Permissions (it's easier to manage permissions at the database level so consider grouping data that is going to be accessed by common groups of users and applications)

Databases (pre 7.0.3)

- You can select from tables in databases you're not connected to.
- There is a 'placeholder' for schema in the naming convention. You can fill this with anything you want.. Or nothing. The following are functionally the same when referring to a table in a database:
  - `database.schema.table`
  - `database.admin.table`
  - `database.cheese.table`
  - `Database..table`

```
SELECT count(*)
FROM database1..table1 t1
INNER JOIN
     database2..table2 t2
ON t1.col1 = t2.col2;
```

- You can only make changes to objects and data in the database you're connected to

```
DB1(ADMIN)=> insert into DB2..test_table values(1);
ERROR:  Cross Database Access not supported for this type of command
```

Tables

- Netezza DDL is simpler than many other systems. Minimum you should specify:
  - Table name
  - Column names and datatypes
  - Distribution key

```
CREATE TABLE stuart_table (col1 INTEGER
                          ,col2 VARCHAR(100)
                          ,col3 DATE)
DISTRIBUTE ON (col1);
```

- Always specify distribution key
- Optionally you can specify:
  - PK/FK relationships (although these are not enforced!)
  - NOT NULL
  - Default values
  - ORGANIZE ON columns for clustered base tables

Tables

- Tables are owned by the user that created them but ownership can be passed on.
  - ALTER TABLE stuart_table OWNER TO new_user
- You can rename columns, add/drop columns
  - But consider creating a new copy of the table instead.
  - If you add or drop a column the system creates a NEW version of the table. As data is written or updated it is put in this new table copy.
  - Over time, performance will degrade as the system effectively UNIONs these two versions of the table.
  - Solution is to run GROOM TABLE tablename VERSIONS as soon as possible after the alter table.
- See the user guide for additional commands.

Views

- Create syntax is as you would expect:

  CREATE VIEW stuart_view AS

  SELECT * FROM stuart_table

- You can select from tables in other databases

  CREATE VIEW stuart_view AS

  SELECT * FROM database2..stuart_table

- If an object a view uses changes, the view will need to be recreated.

Synonyms

- Use synonyms where:
  - You want to reference an object by a different name
  - You want to reference an object in another database without using the database qualifier
- You can use a synonym on a table, view, aggregate or function (very useful for user defined functions and aggregates– this will be revisited later).

Other object types

- PureData for Analytics systems support a number of object types. We have not discussed:
  - Stored procedures
  - Materialized views
  - Sequences
  - External tables
  - Temporary tables
- These are all available and discussed in depth in the user manuals and training courses available.

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Support toolkit scripts

- In /nz/support/bin you will find a large library of very useful scripts.
- You will also find a readme.html file. Download to your PC! This file contains the help text for over 250 utility scripts designed to make your life easier.
- If you want a one-liner on each script's purpose.. there is a script for that!

  nz_help –h

  Usage: nz_help [search_string]

  Purpose: Provide help (a listing) of the scripts that are included with this toolkit.

- Each script has help built into it.

  nz_scriptname -?

Other supporting scripts

- /nz/support/bin/adm/disk_monitor
  - Logs information on disk health and recommends proactive action on disks that may be failing
- /nz/kit/bin/adm/nzhealthcheck
  - Will review system health and can report on a variety of issues.

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SQL Extensions

- PureData for Analytics appliances have a large number of built-in functions that are typically ANSI standard functions. In addition we provide the functionality for customers to create their own functions and aggregates.
- This has been used by IBM to provide a wide array of fully supported functions that expand the flexibility of the PureData platform. These include:
  - Array processing
  - Regular expressions
  - XML manipulation
  - Text encoding, compression and manipulation
  - Date manipulation

SQL Extensions

- Can be downloaded from FixCentral
- The install package includes a user manual and installation guide
- When installing, it is advisable to install the functions in a single central database.
- From here you can create synonyms in all databases that require this functionality
  - This means that upgrading SQL Extensions only has to take place in one database.
  - Access can be easily controlled.

- **Installing or uninstalling SQL Extensions does not require system downtime.**

- Example: Assume the SQL Extensions have been unpacked to /export/home/nz/sql_toolkit/
- Create a database to hold the functions:

```
create database sql_ext;
```

- Register the functions:

```
/export/home/nz/sql_toolkit/libnetcrypto/1.5/install-d sql_ext

/export/home/nz/sql_toolkit/libnetxml/1.5/install-d sql_ext
```

- Generate CREATE SYNONYM commands to run in databases you want to use the SQL Extensions in:

```
select distinct 'create synonym '||function||' for sql_ext..'||function||';'
  from _v_function where builtin = ‘f';

select distinct 'create synonym '||aggregate||' for sql_ext..'||aggregate||';' from
  _v_aggregate where builtin = ‘f';
```

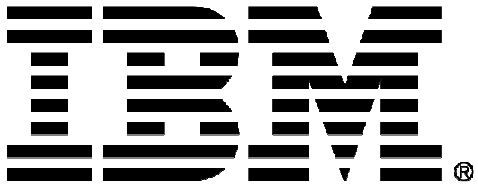
- Run these generate statements when a database needs these functions available.
- Ensure users have the correct rights on these functions and aggregates:

```
Grant execute on function,aggregate to new_user;
```

IBM Netezza Analytics

- The PureData for Analytics was built with advanced analytics and data processing at its core
- In order to facilitate this, IBM provides a comprehensive collection of analytic functionality designed from the ground up to work on an AMPP platform
- Details on the functionality provided is available on request!

- In order to install this functionality, download the software package from FixCentral.
- An installation guide is included and should be followed. The installation does not require downtime.
- The INZA functions will by default be installed in a central location and should be referenced as required.



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